

Remarks

Claims 91-98, 100-103 and 163-182 are pending in the Application.

Claims 91-98, 100-103 and 163-182 are rejected.

Claim 93 is amended herein.

I. CORRECTIONS TO CLAIMS

Examiner has noted that Claim 93 has an unmatched bracket. Office Action, at 2.

Applicant has amended Claim 93 to delete this bracket.

II. REJECTIONS UNDER 35 U.S.C. § 112, ¶ 2

Examiner has rejected Claims 91-98, 100-103 and 163-182 under 35 U.S.C. § 112, ¶ 2, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Office Action, at 2.

Examiner contends “[i]n claim 91, 93, 94, etc. it is not clear how a fiber can be composed of other fibers, especially as to what is meant (aspect ratio, etc.) by ‘macroscopic carbon fiber.’ It is not clear if self-assembled nanotubes are meant, or whether the substructure of a carbon fiber is claimed.” Office Action, at 2.

Claim 91 claims “A macroscopic carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation.” Applicant respectfully submits that the term ‘macroscopic carbon fiber’ is not indefinite. Applicant has defined the term in the Application as follows.

As used herein, the term "macroscopic carbon fiber" refers to fibers having a diameter large enough to be physically manipulated, typically greater than about 1 micron and preferably greater than about 10 microns.

(Application at 38, ll. 4-7)

Furthermore, the Application further defines the “macroscopic carbon fiber” length.

The macroscopic carbon fiber of this invention will generally be at least 1 millimeter in length, with the exact length depending upon the particular application for which the fiber is used.

(Application at 46, *ll.* 26-28)

Claim 93 claims “A composite fiber comprising a plurality of macroscopic carbon fibers, wherein the macroscopic carbon fibers comprises at least about 10^6 single-wall carbon nanotubes in generally parallel orientation.” Applicant respectfully submits that the claim is not indefinite. Except for monofilament fibers, many common fibers or threads are composed of multiple fibers or threads. The Application describes several embodiments of a composite fiber as follows.

In addition to the masking and coating techniques described above, it is possible to prepare a composite structure, for example, by surrounding a central core array of metallic SWNTs with a series of smaller circular non-metallic SWNT arrays arranged in a ring around the core array as shown in **Fig. 9**.

Not all the structures contemplated by this invention need be round or even symmetrical in two-dimensional cross section. It is even possible to align multiple molecular array seed templates in a manner as to induce nonparallel growth of SWNTs in some portions of the composite fiber, thus producing a twisted, helical rope, for example.”

(Application at 43, *ll.* 8-16)

Accordingly, as the terms of the claims are defined, Applicant respectfully requests Examiner to withdraw his rejection of 91-98, 100-103 and 163-182 under 35 U.S.C. § 112, second paragraph.

III. REJECTIONS UNDER 35 U.S.C. § 102(b)/ § 103(a) OVER GUO ALONE OR GUO IN VIEW OF WANG

Examiner has rejected Claims 91, 93, 94-97, 100, 163-178 under 35 U.S.C. § 102(a) as being anticipated by or in the alternative, under 35 U.S.C. § 103(a) as obvious over Guo et al., “Catalytic growth of single-walled nanotubes by laser vaporization”, *Chem. Phys. Letters* **243** (1995) pp 49-54 (“Guo”), alone or in view of Wang, et al., “Growth and characterization of buckybundles”, *Appl. Phys. Lett.* 62 (16), 19 April 1993, pp. 1881-3 (“Wang”). Office Action, at 2. Applicant traverses these rejections.

A. Anticipation

Anticipation requires each and every element of the claim to be found within the cited prior art reference. Examiner apparently contends that *Guo* discloses all of the elements of the claims because the *Guo* “reference teaches single-wall nanotubes.” Office Action, at 2-3.

Claim 91 requires:

“A macroscopic carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation.”

Claims 94-97 and 163-168 depend either directly or indirectly from Claim 91. Claims 93, 94, 170-178 all either contain a macroscopic carbon fiber as described in Claim 91 or depend from a claim that does. Claim 100 includes the element of “a continuous carbon fiber [which] comprises at least about 10^6 single-wall carbon nanotubes in generally parallel orientation...”

Thus, all of these claims require more than simply a particular number of nanotubes. They require a macroscopic carbon fiber or a continuous carbon fiber having at least a specified number (about 10^6) of single-wall carbon nanotubes and oriented in a particular manner (generally parallel). *Guo* fails to disclose such features.

Applicant respectfully points out that *Guo* teaches only a method for growing single-wall carbon nanotubes. No mention is made of macroscopic carbon fiber or continuous carbon fiber of such nanotubes. Furthermore, *Guo* does not teach or suggest a macroscopic carbon fiber or continuous carbon fiber of at least about 10^6 single-wall carbon nanotubes in generally parallel orientation; nor is there any teaching or suggestion in *Guo* to the specific arrangement of such a number of single-wall carbon nanotubes.

Because these elements are not disclosed in or taught by *Guo*, Claim 91 cannot be anticipated.

Regarding Claims 94-97 and 163-168, all of these claims are dependent upon Claim 91, and are not anticipated for the same reasons that Claim 91 is not anticipated by *Guo*.

In addition, Claims 94-97 and 163-168 involve types of nanotubes, which *Guo* does not teach or suggest. Claim 94 also includes the element of a molecular template array for growing continuous length carbon fiber. *Guo* does not teach or suggest a molecular template array for

growing continuous length carbon fiber. Claim 95 requires the macroscopic fiber to have a length of at least 1 millimeter. *Guo* does not teach or suggest a macroscopic fiber of any length. Claim 96 requires a macroscopic carbon fiber “wherein a substantial portion of said nanotubes are of the (n,n) type” and Claim 97 requires that “all of said nanotubes are not of the same type.” *Guo* does not teach or suggest a macroscopic fiber comprising any nanotube type. Claim 163 requires that “the single-wall carbon nanotubes are arranged in a regular triangular lattice.” *Guo* does not teach or suggest such an arrangement for nanotubes. Claims 164 and 165 require that the fiber have a “cross sectional dimension of least one micron” and “a cross sectional dimension in the range of between about one micron and about ten microns”, respectively. *Guo* does not teach or suggest such a cross sectional dimension for nanotubes. Claim 166 requires that “the fiber is at least one millimeter in length.” *Guo* does not teach or suggest such a length for nanotubes. Claim 167 and 168 requires that the fiber further comprise “a dopant intercalated between the single-wall carbon nanotubes” and that “the dopant comprises a substance selected from the group consisting of metals, halogens, FeCl₃ and combinations thereof.” *Guo* does not teach or suggest a dopant or any specific kind of dopant. Accordingly, Claims 91, 93, 94-97, 100, 163-178 are not anticipated by *Guo*.

Therefore, as a result of the foregoing, Applicant respectfully requests that the Examiner withdraw his rejection of Claims 91, 93, 94-97, 100, 163-178 under 35 U.S.C. § 102(b) as being anticipated by *Guo*.

B. Obviousness

Examiner has rejected Claims 91, 93, 94-97, 100 and 163-178 under 35 U.S.C. § 103(a) as obvious over “*Guo*,” alone or in view of *Wang*. Office Action, at 2.

Applicant respectfully traverses these rejections.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable

expectation of success must both be found in the prior art and not based on applicant's disclosure. See M.P.E.P. 706.02(j); see also *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

Regarding Claims 91, 93, 94-97, 100, and 163-178, *Guo* alone does not teach or suggest all the claim limitations. Regarding independent Claims 91, 93, 94, 100, and 169-178, and, as noted above, *Guo* alone does not teach or suggest a macroscopic carbon fiber or continuous carbon fiber of at least about 10^6 single-wall carbon nanotubes in generally parallel orientation; nor is there any teaching or suggestion in *Guo* alone regarding nanotube arrangement such number of single-wall carbon nanotubes. Since the *Guo* does not teach or suggest all the claim limitations of the independent claims, it follows that *Guo* does not teach or suggest all the claim limitations of dependent Claims 95-96 (dependent on Claim 94) and Claims 163-168 (dependent directly or indirectly on Claim 91). Furthermore, *Guo* provides no motivation to one of ordinary skill in the art to modify the teachings of *Guo* to produce a macroscopic carbon fiber or continuous carbon fiber of at least about 10^6 single-wall carbon nanotubes in generally parallel orientation, a requirement contained in each of Claims 91, 93, 94-97, 100 and 163-178. The lack of suggestion or motivation causes the establishment of *prima facie* case of obviousness to fail.

Furthermore, regarding the rejection of Claims 91, 93, 94-97, 100, and 163-178 under 35 U.S.C. § 103(a) as obvious over *Guo* in view of *Wang*, a *prima facie* case of obviousness also fails for lack of any suggestion or motivation, in either *Guo* or *Wang* to combine reference teachings.

Wang teaches bundles of "buckytubes with diameters in the range (20-300 Å)". (*Wang*, abstract at 1881.) From this description, the nanotubes of *Wang* are clearly multi-wall carbon nanotubes (single-wall carbon nanotubes are generally acknowledged to have been co-discovered in 1993 by Iijima and Bethune and their respective co-workers, see Iijima *et al.*, *Nature*, **1993**, 363, 603; and Bethune *et al.*, *Nature*, **1993**, 363, 605). Claims 91, 93, 94-97, 100, and 163-178 each require single-wall carbon nanotubes, which are almost always less than 3.5 nm in diameter. The distinction between single-wall and multi-wall carbon nanotubes is important because multi-wall carbon nanotubes are fundamentally different from single-wall carbon nanotubes.

Single-wall carbon nanotubes (SWNT) have only a single layer of sp^2 -hybridized carbon atoms generally arranged in a hexagons and pentagons. Because of their single-layer, SWNT generally cannot support defects in growth and are more susceptible to destruction by bond breakage or reaction. In contrast, multi-wall carbon nanotubes are composed of multiple, cylindrical concentric carbon layers arranged in a nested fashion (analogous to Russian “nesting dolls”). Because of this arrangement, the carbon shells of multi-wall carbon nanotubes can withstand wall defects, which often appear as dislocations, kinks, holes, edges on the side-wall surfaces, *etc.* Also, because of their multiple layers and the interconnections between these layers, multi-wall nanotubes can withstand much more rigorous chemical processing, physical conditions, and extensive chemical bond breakage without nanotube destruction compared to single-wall carbon nanotubes.

Single-wall carbon nanotubes are flexible and can “rope” together. Since single-wall carbon nanotubes are held tightly by van der Waals forces, they are difficult to separate and disperse in other media. In contrast, multi-wall nanotubes are stiff, rigid and inflexible. Multi-wall carbon nanotubes are not known to rope like single-wall carbon nanotubes, and, as such, multi-wall carbon nanotubes are readily separable and dispersible. The structural differences between single-wall and multi-wall carbon nanotubes result in numerous differences in physical and chemical properties, such as tensile strength, modulus, flexibility, thermal conductivity, electrical conductivity, chemical reactivity and chemical stability. The multitude of physical and chemical fundamental differences between single-wall nanotubes and multi-wall nanotubes provides a basis for expecting and obtaining quite different results with single-wall nanotubes versus multiwall carbon nanotubes in compositions or structures comprising them.

Examiner contends *Guo* “teaches single-wall nanotubes” although “[t]he number is not taught...*Wang* shows that nanotubes assemble in numbers 10 times those claimed. Therefore, it is expected that *Guo* makes the claimed number of nanotubes.” Office Action, at 3.

The expectation that the number of nanotubes made in *Guo* is comparable to the number reported for bundles of multi-wall carbon nanotubes in *Wang* is without merit. Just on the basis of the many chemical and physical differences between single-wall and multi-wall carbon nanotubes, let alone the differences in preparation methods, one of ordinary skill in the art would

not expect a similarity in the number of assembled single-wall carbon nanotubes compared to multi-wall carbon nanotubes.

To expect that *Guo* makes the claimed number of nanotubes, Examiner could be implying that this number is made inherently. However, for inherency to be shown, extrinsic evidence must be presented that makes “clear that the missing descriptive matter is *necessarily* present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991) (emphasis added). Inherency cannot be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is legally insufficient. *Id.*, 948 F.2d at 1269, 20 U.S.P.Q.2d at 1749.

Examiner also contends that *Guo*, “While not teaching the same product exactly, where the examiner has found substantially the same product as claimed in the art, the burden is upon the applicant to show a difference; *In re Fitzgerald et al.* 205 USPQ 594.” Office Action, at 3.

In order for the burden to shift to the applicant, Examiner must make a *prima facie* case of equivalence. Applicant disagrees with the inference that the present claims are directed to “substantially the same product as claimed in the art” [of *Guo*]. Applicant respectfully traverses the rejection based on Examiner’s contention that the claimed product is substantially the same product as taught in *Guo*.

Guo teaches a method for making single-wall carbon nanotubes by laser vaporization in which the nanotubes align spontaneously during formation. However, *Guo* does not teach a macroscopic carbon fiber or a continuous carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation. The nanotubes of *Guo* are microscopic and appear to be roped in bundles with less than 30 nanotubes wide in cross-section. (*Guo* at p. 52) With a cross-section of this dimension, the number of assembled nanotubes in the single-wall carbon nanotube ropes of *Guo* would be much less than 10^3 .

Applicant has taught in the specification of the present application that the teachings of *Guo* are neither equivalent, nor substantially the same as, the invention in the present application. Applicant has distinguished a “macroscopic carbon fiber” from the art of *Guo* in the Application.

Generally, the macroscopic carbon fiber produced according to this invention consists of a sufficient number of substantially parallel single-wall nanotubes that it is large enough in diameter to be practically handled as an individual fiber and/or processed into larger continuous products. The macroscopic nature of the assembly of nanotubes is also important for end uses such as transmission of electric current over these nanotube cables. A macroscopic carbon fiber according to this invention preferably will contain at least 10^6 single-wall carbon nanotubes, and more preferably at least 10^9 single-wall carbon nanotubes. The number of assembled nanotubes is vastly larger than the number ($< 10^3$) that spontaneously align during the formation of single-wall nanotube ropes in the condensing carbon vapor of a carbon arc or laser vaporization apparatus. For many applications the preferred diameter of the macroscopic carbon fiber of this invention will be in the range of from about 1 to about 10 microns. Some applications, e.g., power transmission cables, may require fiber diameters of up to a few centimeters. (Application at 46, *ll.* 10-23)

In addition, and, in contrast to *Guo*, the present “macroscopic carbon fiber” is large enough to be handled as individual fiber. As such, the nanotubes of the present invention have different properties than the nanotubes of *Guo*, which are too small to be handled or processed as individual fiber. In addition, the single-wall nanotubes and ropes of *Guo* are tangled, and held in tangles at their contact points by van der Waals forces, such that the nanotubes and ropes of *Guo* would remain tangled and would be extremely difficult, if not impossible, to untangle and align without modifying the nanotubes in a physical and/or chemical way. In the Application, Applicant has provided numerous examples of arrays of 10^6 nanotubes and uses for macroscopic carbon fiber, the properties of which could not be realized by the nanotubes and teachings of *Guo*.

Further, regarding Claims 91, 93, 94-97, 100, and 163-178, Examiner contends that, “In so far as the rejection is under ‘103, then it is noted that the quantity of a material does not impart patentability, *In re Rose* 105 USPQ 137.” Office Action, at 3.

Applicant respectfully traverses the rejection based on Examiner’s citation of *In re Rose* 220 F.2d 459, 105 U.S.P.Q. 237 (C.C.P.A. 1955) directed to the proposition that “the quantity of a material does not impart patentability.” As binding case law and the M.P.E.P. reflect, this is a misstatement of the law, and the Examiner’s reliance on *In re Rose* to make these obviousness rejections is misguided.

The Federal Circuit and its predecessor court have long recognized that a claim, while not anticipated, can be held to be obvious when the *only* difference between the prior art and the claims was a recitation of relative dimension of the claimed invention *and* the invention having the claimed relative dimensions would not perform differently than the disclosure in the prior art reference. M.P.E.P. § 2144.04(IV)(A) (citing *In re Rose*, 220 F.2d 459, 105 U.S.P.Q. 237); *See also Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 1345, 220 U.S.P.Q. 777, 783 (Fed. Cir. 1984).

As cited above, the “macroscopic carbon fiber” of the present Claims *does* perform differently than the nanotubes and ropes of *Guo*, and, as such, can be used in different and distinct end-uses that the nanotubes and ropes of *Guo* would not be effective. Thus, the present invention cannot be held obvious based on the quantity of material.

As noted above, there are differences between the prior art and the claims that go well beyond dimensional differences. At least some of the non-dimensional differences absent in *Guo* have been discussed above in Section III.A. Furthermore, the resulting product, as claimed, has many properties and uses that the products disclosed and taught in *Guo* do not have. These are discussed in detail throughout the Application, such as at 45-56. Thus, the claimed invention is not simply a scaling up in size or quantity of the materials disclosed in *Guo*. Rather, it is the creation of a new and non-obvious product. The non-obviousness of the claimed invention under the present circumstance is in complete accord with Federal Circuit and its predecessor court's long standing precedent, which reflects that when the size or amount of the invention leads to compositions that have unique and novel properties and use (and also when something is produced that theretofore had not been able to be accomplished), that such an invention was non-obvious and patentable. *See In re Kirke*, 40 F.2d 765, 767, 5 U.S.P.Q. 539 (C.C.P.A. 1930);¹ *see also Gardner*, 725 F.2d at 1345, 220 U.S.P.Q. at 783.

Regarding Claim 167. Examiner contends that “The dopant of claim 167 is deemed met by catalyst particles expected to be present.”

¹ The holding in *In re Rose* is premised upon the Court of Custom and Patent Appeal's opinion in *In re Kirke*. *See In re Rose*, 220 F.2d at 463, 150 U.S.P.Q. at 240 citing *In re Yount*, 171 F.2d 317, 318, 80 U.S.P.Q. 1441, 143 (C.C.P.A. 1948), which in turn cited *In re Kirke*, 40 F.2d 765, 5 U.S.P.Q. 539, all of which when discussing the implications of a change of size or amounts for potential inventions.

Applicant respectfully traverses the argument. First, the word “dopant” was used in an ordinary and customary meaning. According to *The Photonics Directory* on-line dictionary, “dopant” is [an] “impurity added to a substance to produce desired properties in the substance.” See Exhibit A. Second, catalyst particles are not an added impurity. Residual catalyst may be present after the nanotubes are made, but are not added as an impurity to the nanotubes. Third, the “dopant” in Claim 167 is required to be “intercalated between the single-wall carbon nanotubes.” Catalyst particles are normally found at the end of the nanotubes or on the outsides of nanotube bundles, rather than intercalated between nanotubes. Fourth, one of ordinary skill in the art would not consider catalyst particles a dopant, or a substance intentionally added to create the desired effect. For these reasons, Applicant contends that catalyst particles would not be considered a dopant.

Accordingly, Claims 91, 93, 94-97, 100, and 163-178 are further not obvious in view of *Guo*, alone or in view of *Wang*. Therefore, as a result of the foregoing, Applicant respectfully requests that the Examiner withdraw his rejection of Claims 91, 93, 94-97, 100, and 163-178 under 35 U.S.C. § 103(a) as being obvious over *Guo*, alone or in view of *Wang*.

IV. REJECTIONS UNDER 35 U.S.C. § 103(a) OVER GUO, ALONE OR IN VIEW OF WANG, AND TAKEN WITH APPLICANTS’ ADMISSIONS AND FISHBINE

Examiner has rejected Claims 98, 101-103 and 179-182 under 35 U.S.C. § 103(a) as obvious over *Guo*, alone or in view of *Wang*, and taken with applicants’ admissions in the specification and Fishbine, “Carbon Nanotube Alignment and Manipulation Using Electrostatic Fields,” *Fullerene Science & Technology*, Vol. 4, No. 1, pp. 87-100, 1996 (“*Fishbine*”). Office Action, at 3.

Examiner contends the references do “not teach the additional materials, however Applicant indicates on specification pgs. 30, 27, 48, etc. that the coaxial cable, composites, etc. are old and known; applicant has a new filler. *Fishbine* indicates in the opening paragraphs that carbon nanotubes have particular properties and is taken to be representative of the known uses of nanotubes.” Office Action, at 3. The examiner takes Official Notice that the non-nanotube structures of these dependent claims are old and known, not[h]ing that there is nothing in the specification to indicate otherwise.” Office Action, at 3.

Examiner further contends that “Using the nanotubes in a composite or manner claimed is an obvious expedient to exploit their emitter, conductive and other properties.” Office Action, at 3.

Applicant respectfully traverses these rejections.

As noted above, to establish a *prima facie* case of obviousness, at least three basic criteria must be met. First, there must be some suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991); *see also* MPEP §§ 2143-2143.03.

Furthermore, In ascertaining the differences between the cited prior art and the claim at issue, the Examiner must evaluate the claimed subject matter as a whole; there is no requirement that the differences themselves be nonobvious. MPEP § 2141.02. The requisite view of the whole invention mandates consideration of not only its structure, but also of its properties and the problems solved. *See* MPEP § 2141.02. Further, the mere fact that the prior art can be modified does not make the modification obvious unless the prior art suggests the desirability of the modification; there must be some logical reason apparent from positive, concrete evidence that justifies the modification. *See* MPEP § 2143.0 1.

Regarding independent Claim 98 and each of the Claims 101-103 and 179-182, which are dependent claims, these three basic criteria are not met. Thus, a *prima facie* case of obviousness has not been established.

Applicant contends that, first, there is no motivation or suggestion in *Guo*, alone or in view of *Wang*, and taken with Applicant's admissions and *Fishbine* to combine the teachings of the references. Second, the teachings of *Guo*, alone or in view of *Wang*, if combined with the teachings of *Fishbine* would not be expected to result in the instant claims. Third, if the teachings of *Guo* alone or in view of *Wang*, were combined with the teachings of *Fishbine*, the combination would not result in all the claim limitations.

The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination without the benefit of hindsight reasoning. As there is no suggestion or motivation, taken without the benefit of hindsight reasoning, either in *Guo*, alone or in view of *Wang*, taken with applicant's admissions and *Fishbine* to combine the references, a *prima facie* case of obviousness has not been established.

Claim 98 claims a composite article of manufacture comprising a matrix material selected from the group consisting of metals, polymers, ceramics and cermets, said matrix comprising macroscopic carbon fibers, wherein the macroscopic carbon fibers comprises at least about 10^6 single-wall carbon nanotubes in generally parallel orientation.

As noted above, *Guo* does not teach or suggest a macroscopic carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation. The teachings of *Guo* and the "macroscopic carbon fiber" of the present invention have been distinguished above. *Guo* further does not suggest a composite comprising "macroscopic carbon fiber." *Guo* does not teach or suggest these elements nor does *Guo* provide suggestion or motivation to make the claimed combination.

Wang involves multiwall carbon nanotube bundles, and, like *Guo*, does not teach or suggest a macroscopic carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation. The teachings of *Wang* and the "macroscopic carbon fiber" of the present invention have been distinguished above. *Wang* further does not suggest a composite comprising "macroscopic carbon fiber." Furthermore, *Wang* provides no teaching or suggestion as to how such macroscopic carbon fibers of single-wall carbon nanotubes could be prepared. *Wang* does not teach or suggest these elements nor does *Wang* provide suggestion or motivation to make the claimed combination.

Fishbine also involves multiwall carbon nanotubes and, as in *Guo* and *Wang*, does not teach or suggest a macroscopic carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation. *Fishbine* does not teach, refer to, or suggest a "macroscopic carbon fiber" of the present invention. Although *Fishbine* mentions that "Alignment of carbon nanotubes can also be used to make novel structural materials (strong, lightweight composites), composites with high thermal conductivity,..." (*Fishbine* at 87), this

general statement does not suggest a composite of the present claim comprising “macroscopic carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation.” *Fishbine* teaches neither the alignment of single-wall carbon nanotubes, nor the formation of an array of any sort. Furthermore, *Fishbine* provides no teaching or suggestion as to how such single-wall carbon nanotube fibers could be prepared. Thus, *Fishbine* does not teach or suggest these elements nor does *Fishbine* provide suggestion or motivation to make the claimed combination.

Regarding Claim 98, as there is no suggestion or motivation in the references to make the claimed combination and taken as a whole do not teach or suggest all of the claim limitations, a *prima facie* case of obviousness is without merit.

Regarding Claims 101-103 and 179-182, all of these claims are directed to a power transmission cable. Claims 101-103 are dependent on Claim 100, which comprises a continuous carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation; and a substantial portion of said nanotubes are of the (n,n) type. As discussed above in Section III. B., Applicant asserts that Claim 100 is not obvious under *Guo*, alone or in view of *Wang*. Furthermore, dependent Claims 101-103 further require certain configurations of the high voltage power transmission cable. None of these particular configurations is taught or suggested in the references, *i.e.*, *Guo* alone or in view of *Wang*, taken with the Applicant’s admissions and *Fishbine*. None of these references even cite a power transmission cable or any construction that might be construed as a power transmission cable. The references, taken together, do not provide motivation or suggestion that would lead one of ordinary skill in the art to produce the claimed configurations.

Regarding Claims 179-182, these claims are directly or indirectly dependent on Claim 178, which comprises a macroscopic carbon fiber comprising at least about 10^6 single-wall carbon nanotubes in generally parallel orientation. As discussed above in Section III. B., Applicant asserts that Claim 178 is not obvious under *Guo*, alone or in view of *Wang*. Furthermore, dependent Claims 179-182 address specific aspects and further require certain particular configurations of the power transmission cable. None of these particular configurations is taught or suggested in the references, *i.e.*, *Guo*, alone or in view of *Wang*, taken

with the Applicant's admissions and *Fishbine*. None of these references even cite a power transmission cable or any construction that might be construed as a power transmission cable. The references, taken together, do not provide motivation or suggestion that would lead one of ordinary skill in the art to produce the claimed configurations.

Applicant respectfully traverses Examiner's contention that Applicant's admissions contribute to the obviousness of Claims 98, 101-103 and 179-182. Applicant has made general statements that define materials, such as "composite materials" (Application at 62), and that also provide meaning and description to the claimed structures of transmission lines (Application at 49). Examiner's conclusion of obviousness appears to be a reconstruction based on improper hindsight reasoning and includes knowledge gleaned from Applicant's disclosure. Such hindsight reasoning is improper.

Therefore, as a result of the foregoing, Applicant respectfully submits that a *prima facie* case of obviousness has not been established, and respectfully requests that the Examiner withdraw his rejection of Claims 98, 101-103 and 179-182 under 35 U.S.C. § 103(a) as being obvious over *Guo*, alone or in view of *Wang*, and taken with Applicants' admissions in the specification and *Fishbine*.

V. CONCLUSION

As a result of the foregoing, it is asserted by Applicant that the Claims in the Application are now in a condition for allowance, and respectfully request allowance of such Claims.

Applicant respectfully requests that the Examiner call Applicant's attorney at the below listed number if the Examiner believes that such a discussion would be helpful in resolving any remaining problems.

Respectfully submitted,

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